

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 28

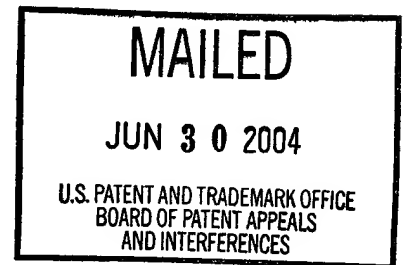
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte YUKIYASU SUGANO, MASAHIRO FUJINO, MICHIO MANO,
AKIHIKO ASANO, MASUMITSU INO, TAKENOBU URAZONO
AND MAKOTO TAKATOKU

Appeal No. 2004-0032
Application No. 09/478,812¹

HEARD: MAY 20, 2004



Before JERRY SMITH, BARRY, and SAADAT, Administrative Patent Judges.
SAADAT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the Examiner's final rejection of claims 11, 12, 17, 18, 27, 28, 39, 40, 53, 54, 63, 65, 73 and 74. Claims 1-10, 13-16, 19-26, 29-38, 41-52, 55-62, 64 and 66-72 have been canceled.

We affirm.

¹ Application for patent filed January 7, 2000, which claims the foreign filing priority benefit under 35 U.S.C. § 119 of the Japanese Applications No. P11-002384, filed January 8, 1999, No. P11-002385, filed January 8, 1999 and No. P11-02498, filed February 20, 1999.

BACKGROUND

Appellants' invention relates generally to a process for crystallizing semiconductor thin films in semiconductor devices, and more specifically, to a method of using laser irradiation for uniform crystallization of a prescribed region of the thin film.

Representative independent claim 11 is reproduced as follows:

11. A thin film semiconductor device comprising a semiconductor thin film, a gate insulating film accumulated on one surface thereof, and a gate electrode accumulated entirely within a prescribed region of said semiconductor thin film through said gate insulating thin film,

wherein said semiconductor thin film is formed by forming a 30 to 80 nm layer of amorphous silicon or polycrystalline silicon having a first particle diameter on a substrate, and irradiating said substrate with an energy beam to convert said semiconductor thin film to polycrystalline silicon having a larger particle diameter than said first particle diameter,

a thin film transistor is integrated and formed in said prescribed region by using said semiconductor thin film thus converted to polycrystalline silicon as an active layer, and

a cross sectional shape of said energy beam is adjusted with respect to said region to irradiate said region in its entirety at a time by a single shot irradiation, so that characteristics of said thin film transistor are made uniform.

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The references relied on by the Examiner in rejecting the claims are:

Tanaka et al. (Tanaka)	5,798,744	Aug. 25, 1998
Miyasaka	6,017,779	Jan. 25, 2000 (filed Feb. 13, 1998)

Claims 11, 39, 53, 63 and 73 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Miyasaka.

Claims 17 and 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Miyasaka.

Claims 12, 18, 28, 40, 54, 65 and 74 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Miyasaka and Tanaka.

We make reference to the answer (Paper No. 21, mailed April 10, 2003) for the Examiner's reasoning and to the brief (Paper No. 20, filed December 27, 2002) and the reply brief (Paper No. 22, filed June 9, 2003) for Appellants' arguments thereagainst.

OPINION

At the outset, we note that Appellants indicate their intention that all of the claims stand or fall together (brief, page 6). Thus, we will consider the claims as one group to the extent they correspond to each ground of rejection and will limit our consideration to independent claim 11.

Appellants contrast the claimed single shot irradiation with the conventional process and assert that the structure resulting from the recited steps avoids the formation of borders in the crystallized silicon (brief, page 7). Appellants argue that the disclosure of Miyasaka is focused on irradiating unit areas individually with overlapping areas due to the movement of the substrate between each irradiation (brief, paragraph bridging pages 7 and 8).

The Examiner responds to Appellants' arguments by pointing out that the fact that the process steps define a particular structure does not mean that the final product is distinguished over the structure disclosed in the prior art (answer, page 8). The Examiner adds that Miyasaka, in fact, teaches a uniform, high-quality crystallized silicon film obtained by irradiating the substrate (id.). Additionally, the Examiner argues that the device made by the process of Miyasaka does not include borders since Miyasaka states that the laser irradiation provides for a "uniform" polycrystalline film (answer, page 9).

Appellants further argue that the uniform polycrystalline silicon substrate of the claimed invention is a result of irradiating the entirety of the unit size of the thin film and making a continuous film which avoids the formation of borders

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in the crystallized silicon (reply brief, page 1). By referring to the instant specification, Appellants point out that such borders are the product of conventional crystallization process that involves the piecemeal irradiation of several adjacent regions of the unit size and slight overlapping of the regions that are separately irradiated (id.). Additionally, Appellants assert that the claimed process steps should be considered in evaluating the product claims to the extent that they attribute specific structural features to the final product (reply brief, page 2).

Before addressing the Examiner's rejections based upon prior art, it is an essential prerequisite that the claimed subject matter be fully understood. Analysis of whether a claim is patentable over the prior art under 35 U.S.C. §§ 102 and 103 begins with a determination of the scope of the claim. The properly interpreted claim must then be compared with the prior art. Claim interpretation must begin with the language of the claim itself. See Smithkline Diagnostics, Inc. v. Helena Laboratories Corp., 859 F.2d 878, 882, 8 USPQ2d 1468, 1472 (Fed. Cir. 1988). See also Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165 (Fed. Cir. 1999) ("The starting point for any claim construction must be the claims

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themselves."). Accordingly, we will initially direct our attention to Appellants' claim 11 to derive an understanding of the scope and content thereof.

Claim 11 is directed to a thin film semiconductor device comprising a thin film, a gate insulating film and a gate electrode "accumulated entirely within a prescribed region of said semiconductor thin film." Therefore, at least parts of a thin film transistor such as a gate electrode and the gate insulating layer are within the "region." The claim further requires that the region be irradiated "in its entirety at a time by a single shot" so that a thin film transistor with uniform characteristics may be obtained. Although the region that includes at least parts of a thin film transistor is required to be irradiated by a single shot, additional irradiation in preceding or subsequent steps are not precluded as long as each irradiation covers that region in its entirety.

A rejection for anticipation under section 102 requires that the four corners of a single prior art document describe every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation. See Atlas Powder Co. v. Ireco Inc., 190 F.3d 1342, 1347, 51 USPQ2d

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1943, 1947 (Fed. Cir. 1999); In re Paulsen, 30 F.3d 1475, 1478-79, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994).

After reviewing Miyasaka, we agree with the Examiner that the reference teaches that a region of the silicon layer, which becomes the active layer of a thin film semiconductor device, is irradiated for crystallization of the thin film silicon (col. 36, lines 18-24). Miyasaka provides for irradiating an 8 mm x 8 mm portion of the silicon layer in a single shot irradiation before shifting the substrate over for irradiating an adjacent portion (col. 36, lines 29-34). As also conceded by Appellants (brief, page 7), Miyasaka further discloses that the entire substrate is irradiated by shifting the 8 mm x 8 mm square irradiation area in 4 mm increments in both the X and Y directions (col. 36, lines 42-45) in order to uniformly crystallize the silicon layer (col. 36, lines 45-48).

Therefore, Miyasaka teaches that a fairly large area (8 mm x 8 mm), which includes at least a gate electrode separated by a gate insulating layer from the thin film silicon layer, is irradiated by a single shot irradiation as the first exposure. Although this may constitute an intermediary product that is formed after the first exposure and before the substrate is shifted to step over the irradiation area during for the next

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irradiation, such structure is not precluded by claim 11. In that regard, the claimed single shot irradiation reads on the very first area prior to shifting the substrate over for the next irradiation in an adjacent area.

Moreover, Miyasaka shifts the substrate in the horizontal direction until the entire length of the substrate in that direction is scanned and then in the vertical direction before the substrate is shifted in the horizontal direction again so that the entire surface of the substrate has been subjected to irradiation (col. 36, lines 32-38). Therefore, in addition to the intermediary product, i.e., the substrate after the first irradiation, a 4 mm x 4 mm part of the first area in the final product remains irradiated only once as the substrate is shifted by 4 mm both in the horizontal and the vertical direction away from this 4 mm x 4 mm part. Thus, contrary to Appellants' reasoning that it cannot be determined whether the structure of Miyasaka includes a single shot irradiation area at all (oral hearing), Miyasaka does disclose a thin film structure including at least a region in the substrate that is irradiated only by a single shot irradiation.

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We are also unpersuaded by Appellants' argument that the claims require a single shot irradiation so that, as stated in page 51, lines 7-12 of the specification, the formation of borders in the crystallized silicon is avoided in the irradiated region (brief, page 7; oral hearing). Observing the Examiner's assertion that page 51 of the specification includes nothing related to avoiding borders and merely discusses uniformity of the crystallized silicon film (answer, page 9), we note that it is the claims that should be scrutinized to determine whether they require the exclusion of such border. Although page 51 of the specification does not mention avoiding borders, the problem of over-irradiating the boundary part is discussed in page 6 of the specification. It appears that Appellants, in an attempt to interpret the claims in light of the specification, actually do import limitations from the specification and define the claimed irradiation by "a single shot irradiation" as creating "borderless irradiated regions."

"We recognize that there is sometimes a fine line between reading a claim in light of the specification, and reading a limitation into the claim from the specification." Comark Communications, Inc. v. Harris Corp., 156 F.3d 1182, 1186, 48 USPQ2d 1001, 1005 (Fed. Cir. 1998). In locating this "fine

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line" it is useful to remember that we look "to the specification to ascertain the meaning of the claim term as it is used by the inventor in the context of the entirety of his invention," and not merely to limit a claim term. Id. at 1187, 48 USPQ2d at 1005. Here in this case, the meaning of the claimed term is clear and extending it to encompass a boarderless region places us on the other side of the line where reading this limitation into the claim from the specification would expand the claims beyond their scope.

Based on our findings related to Miyasaka and the analysis made above, we find that the Examiner has established a prima facie case of anticipation with respect to claim 11. Therefore, the 35 U.S.C. § 102 rejection of the representative claim 11 and claims 39, 53, 63 and 73, which fall together with claim 11, over Miyasaka is sustained.

With respect to the rejection of the remaining claims under 35 U.S.C. § 103, we note Appellants' designating of all the claims as falling with claim 11. Accordingly, we sustain the 35 U.S.C. § 103 rejection of claims 17 and 27 over Miyasaka and claims 12, 18, 28, 40, 54, 65 and 74 over Miyasaka and Tanaka.

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